SOIL conservation

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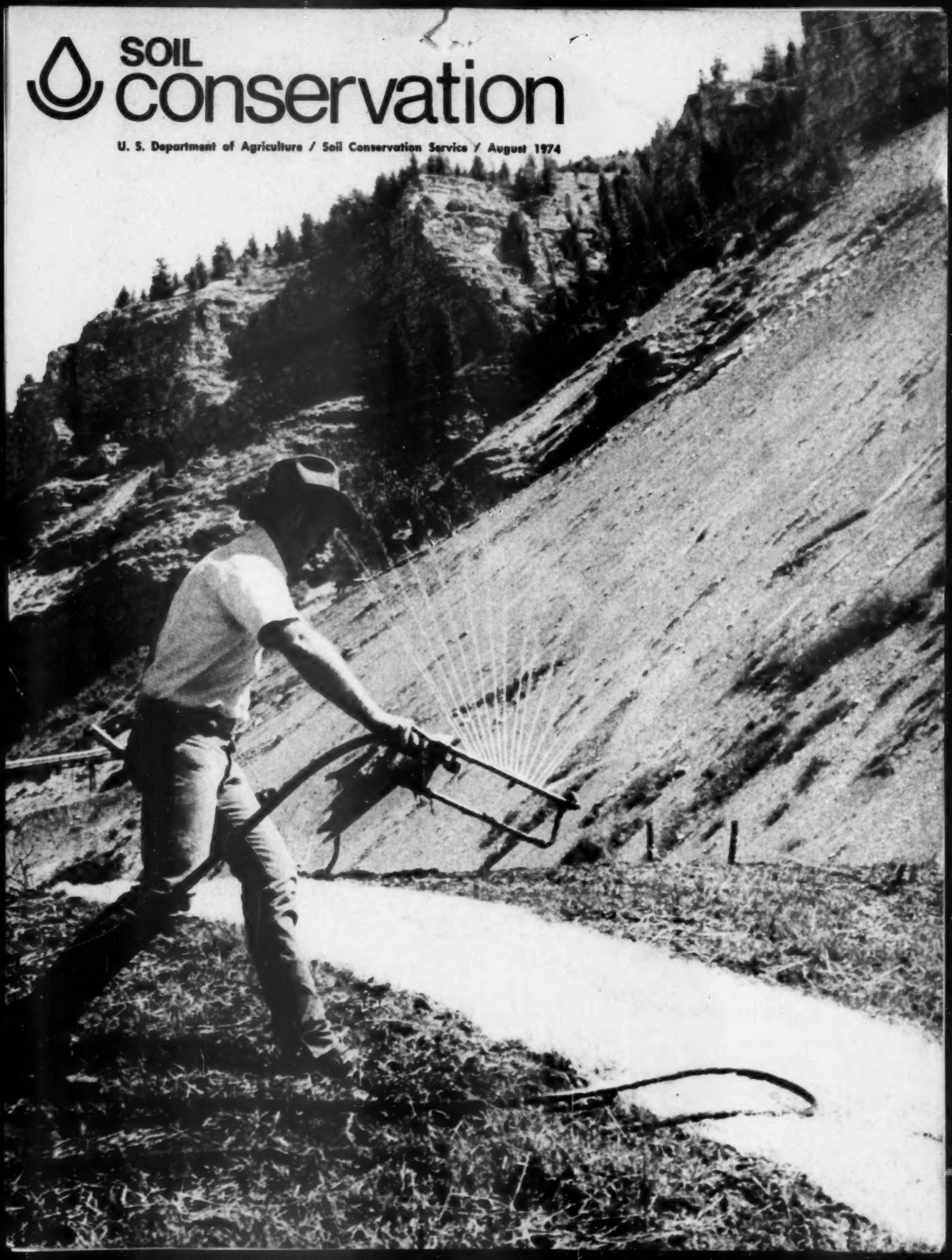

From the Administrator

Advocacy and the Service

We talk a lot these days about furnishing *facts* to people. Facts about soils. Facts about erosion control. Facts about land use. The idea is that, armed with enough facts, people will make informed choices among various alternatives.

But let's not forget that the Service has always been more than a fact-gathering agency. We were born and bred on advocacy. Beginning with our first Chief, Hugh Hammond Bennett, who was personally convinced that the economic health of this nation grows from "good soil used intelligently," to the modern district conservationist preaching the virtues of minimum tillage, SCS has always taken strong positions.

We have been *for* conservation of soil and water. We have been *for* the stewardship of our resources. We have been *for* flood prevention and the enhancement of fish and wildlife habitat. We have been *for* the use of soil surveys in land use planning.

The organization that gets things done, and that wins the support and respect of other Americans, is the organization that is not afraid to advocate its cause in a strong, clear voice.

Today, in addition to our longtime positions of advocacy, we are responding to newer concerns. One of these is noted in the Secretary of Agriculture's Memorandum 1827 which states, among other things, that the Department of Agriculture will help to enhance and preserve prime agricultural, range, and forest lands.

There are serious problems to many segments of society if prime farmland is gobbled up indiscriminately for use in suburban and industrial development. The amount of prime farmland available for many crops is limited. And if sufficient prime agricultural land is not maintained in production, the effect on food prices and the general economy can be significant.

Land owners and operators and rural and urban governmental bodies make the ultimate decisions on land use, as they should do and will continue to do. But it is well within the purview of SCS responsibilities to advocate viewpoints or actions that are clearly consistent with our mission. We are a major action agency in the natural resource field, and we cannot act—or help others to act wisely—if we remain quiet when issues of vital concern to conservationists arise.

The Soil Conservation Service will continue to provide resource data and other help in the most impartial manner possible. And we will continue to speak up—to be an advocate—when, by virtue of our particular expertise we can make a direct contribution to solving some of today's concerns. Anything less is an underutilization of our knowledge and experience.

Kenneth E. Grant

SOIL conservation

August 1974, Vol. 40, No. 1

Contents

2 From the Administrator

4 SCS and the oil shale program
by M. D. Burdick

7 Wet, wild spring in Iowa
by Lynn Betts

9 Good news for Louisiana wildlife
by Gene Warren

10 Helping small town Maine
by Vincent J. Price

12 What about plastic tubing?
by Elmer L. Barker

14 Green plants keep gold a'coming from California's foothills
by W. Curtis Sharp and Clarence U. Finch

16 Plant materials and waste management
by Donald H. Fulton and Glen L. Nielson

19 Progress in stabilizing manganese mine spoil
by H. Wayne Everett

20 New version of multiflora rose?
by Diana Morse

21 Recon

22 Soil surveys

23 Meetings

COVER: Mulching and preparing processed shale plots for revegetation. (See "SCS and the oil shale program.")

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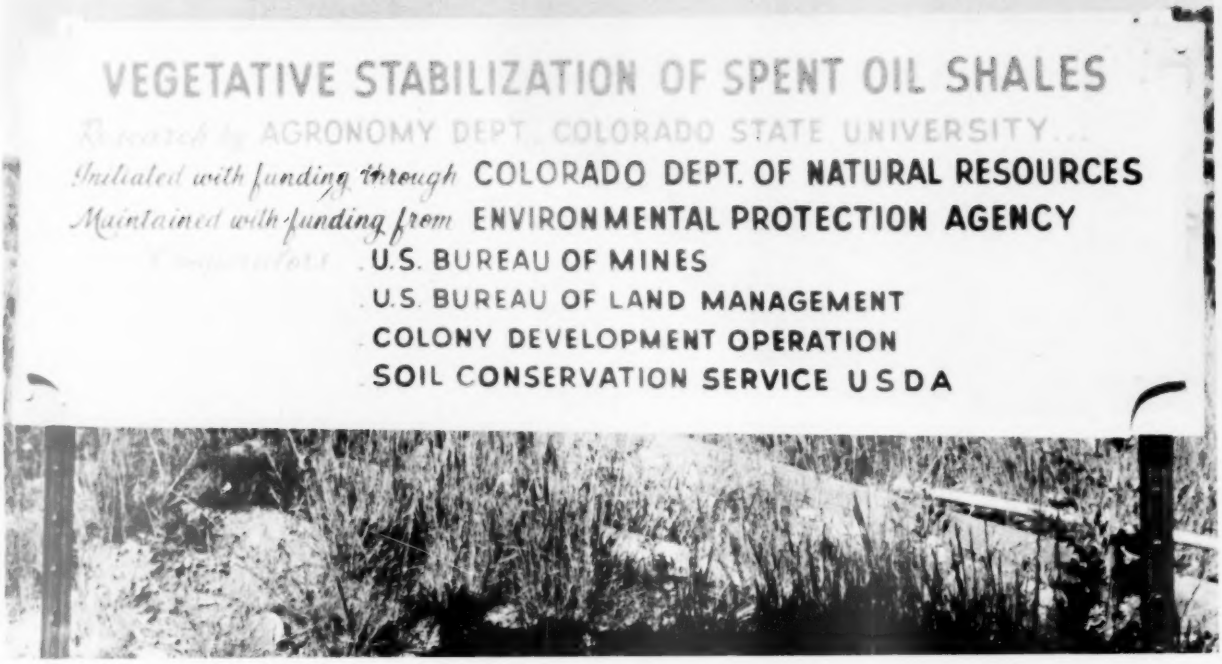

VEGETATIVE STABILIZATION OF SPENT OIL SHALES
Initiated with funding through COLORADO DEPT. OF NATURAL RESOURCES
Maintained with funding from ENVIRONMENTAL PROTECTION AGENCY
U.S. BUREAU OF MINES
U.S. BUREAU OF LAND MANAGEMENT
COLONY DEVELOPMENT OPERATION
SOIL CONSERVATION SERVICE USDA

2,000 billion barrels

SCS and the oil shale program

by M. D. Burdick
State conservationist, SCS
Denver, Colorado

The Green River Formation in eastern Utah, northwestern Colorado and southern Wyoming contains about two trillion barrels of oil, of which approximately 600 billion barrels are recoverable with present technology.

Oil shale deposits of commercial interest underlie an area of approximately 25,000 square miles. Shales yielding an average of 25 gallons a ton occur in deposits that vary in thickness from 10 to 2,000 feet.

Approximately 80 percent of the richest oil shale deposits of the Green River Formation are located in the Piceance Creek Basin of northwestern Colorado. They contain an estimated 480 billion barrels of oil. About 72 percent of these deposits occur beneath public lands administered by the Department of The Interior.

In 1971, the Interior Department announced the Prototype Oil Shale Leasing Program whereby six tracts of public land, each containing 5,120 acres, were leased by competitive bid for commercial development.

Colorado, Utah, and Wyoming each contain two of the leased tracts. The total leased area is approximately 0.5 percent of the commercially valuable oil shale deposits. Further leasing will depend upon industry's ability to develop oil shale without unacceptable detrimental effects to the environment.

Background

The Prototype Oil Shale Leasing Program was preceded by intensive state-directed stud-

ies on the environmental impact of oil shale development and the costs of appropriate environmental controls.

In Colorado, the Governor's Committee on Oil Shale Environmental Problems (COSEP) includes representatives from state and federal agencies and private groups and companies.

The Governor's committee is segmented into four subcommittees, each dealing with a major environmental concern —water, resource inventories, revegetation and land rehabilitation, and the socio-economic aspects of oil shale development. The subcommittees are charged with the responsibility of identifying research needs, formulating research programs, and selecting contractors to carry out the needed research. Steering committees will guide and monitor the work.

From the beginning

Soil Conservation Service people in Colorado have been deeply involved in the revegetation and land rehabilitation aspects of the oil shale program. Colorado State Resource Conservationist E. F. Sedgley was assigned the primary responsibility for SCS participation.

Sedgley has been a member of the Governor's subcommittee for revegetation and land rehabilitation since its formation in 1970. For the past year, he has been the subcommittee's chairman, as well as chairman of the steering committee which directs the research program by Colorado State University.

In 1971, Sedgley became the Department of Agriculture's field representative on the Federal Oil Shale Task Force where he served on all major committees including the tract selection committee, lease stipulations committee, and the committees that prepared environmental impact statements for the prototype program.

When Interior Secretary Rogers C. B. Morton and his staff toured the oil shale region in 1971, Sedgley served as the Secretary's technical advisor for revegetation. In 1973 he received an official commendation from the Secretary.

SCS people have also worked with private companies. The Colony Development Operation of Atlantic Richfield Oil Company has invested several million dollars in oil shale related environmental studies. As a cooperator with the Bookcliff Soil Conservation District, the company received technical assistance from SCS on plant materials for revegetation as well as more general natural resource information.

The mining process

There are three possible ways to process oil shale:

- open pit mining
- room and pillar underground mining
- in-situ mining.

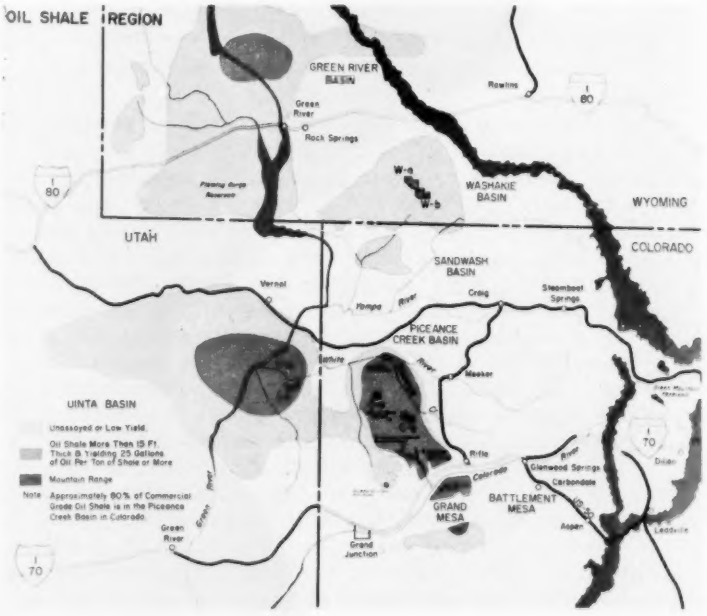
The first two require removal of the oil shale to above ground retorts where the organic compound is removed by volitalization at temperatures of around 900° F. In-situ mining is accomplished by heating the oil shale underground and pumping the shale oil to the surface.

At present, it appears that above ground retorting will be practiced on nearly all of the proposed mining sites. At least one site in Colorado will be partially mined by the open pit method.

There will be at least two major types of revegetation and land rehabilitation problems connected with the mining process: disturbed areas caused directly or indirectly by mining operations, and the disposal of mining waste materials.

Changes

If present development plans are followed, the number of people living in the oil shale region may double in the next 10 years. Land will be greatly



Map of the oil shale areas in Colorado, Utah, and Wyoming.

altered as new plants, new towns, railroads, highways, utility corridors, and other facilities follow people and mining into the area. It is extremely important that planners do a good job in selecting new areas and planning for their development.

The Department of The Interior stipulates that oil company lessees must make extensive baseline natural resource inventories, monitor environmental conditions, and restore environmental values to a level at least equal to those existing before development. Among other specific requirements, the lessees must have an SCS-type soil survey of their area and an inventory of the present vegetation.

Afterwards

Altering a region to accommodate new people and land uses is a major challenge to planners. But stabilizing waste disposal sites may be even more difficult.

A 100,000-barrels-of-shale-oil-a-day operation will produce about 20 billion cubic feet of spent shale residue over a 20-year period. This would fill a canyon 10 miles long, 2,000 feet wide and 200 feet deep. In terms of material removed, the proposed oil shale development will be the biggest operation in the world.

Spent shale material varies somewhat depending upon the system of retorting. It is generally a black carbonized material very high in soluble salts and devoid of basic plant nutrients such as nitrogen and phosphorus.

The spent shale material will support a variety of plants if it is leached, mulched, fertilized, and irrigated.

SCS and other agencies and groups are making field evaluation plantings on areas of pure spent shale, half shale and half soil, and areas where the original soil material has been only slightly disturbed. Early indications are that the slightly disturbed areas are easily revegetated, the half-and-half areas are moderately successful, while—as expected—without intensive treatment most plantings on spent shale areas alone have not survived. Work is underway to test a variety of plant species that may be more adaptable to growth on the spent shale material.

Many groups are involved in field test plantings. The Service has provided plant materials to oil companies and Colorado State University for use in their research projects. In addition, several extensive field evaluation plantings have been established by SCS to test a variety of plants for adaptability to special site conditions resulting from oil shale development.

SCS is the primary group field testing plants that will grow without irrigation. We are particularly interested in learning which plants can grow successfully under "natural" conditions, for example, plants that will survive without major assistance from man after he leaves the area.

As the program evolves and needs are identified, demands for SCS assistance will continue to increase.

Soil surveys and range site and condition surveys are emerging as required baseline data for inventorying and monitoring environmental values. The range site concept of SCS is popular with environmentalists and wildlife interests because it identifies not only the present plant communities but also the potential ones.

Due to past grazing use, much of the oil shale area is presently occupied by plant communities producing only half or less of the site potential. On some sites, plant communities below the potential are desirable if they produce browse plants needed by game animals.

Much of the oil shale land is used by wildlife. For example, the Piceance Creek Basin—where 80 percent of the richest oil shale deposits are located—is the wintering range of the

continued on p. 18

SCS assistance to people and agencies involved in the Prototype Oil Shale Leasing Program includes:

—Soils information. Provides baseline data on the land, and is used to help select the best areas for mining operations, new town areas, related facilities, and revegetation potentials.

—Range site and condition surveys. Identifies present and potential vegetative plant communities of the area. Indicates what will grow, which in turn determines which wildlife are attracted to the area.

—Help in establishing good conservation practices on mined land. This might mean limiting the steepness of the slope, stockpiling topsoil for later return, adding dams or other water diversions.

—Help in stabilizing oil shale waste disposal sites.

—Help in testing, selecting and planting the most desirable shrubs, forbs, trees, and grasses in an area, taking into account the planned land use and special problems such as accelerated erosion or difficult climatic conditions.

Wet, wild spring in Iowa

by Lynn Betts
Information specialist, SCS
Des Moines, Iowa

This spring, Iowa suffered the worst erosion it's had in almost 25 years.

A survey by the Soil Conservation Service in Iowa shows that about 4½ million acres of the state's 20.7 million acres of corn and soybean land suffered severe erosion—a loss of more than 10 tons an acre. Another 1.1 million acres of land were flooded.

Farmer Bob Bruxvoort of Jasper County, Iowa, had 250 acres of cornland flooded twice this spring. Here, he and his wife Jan clean out sediment from a drainage ditch.

Estimates by SCS field offices indicated 570,000 acres of cropland won't be producing a crop at all this year because of severe erosion or flooding, and another 1.5 million acres of cropland will yield no better than half the normal crop.

More than a third of the state has been declared a disaster area because of floods, severe thunderstorms, and tornadoes. Soil losses of 40 to 50 tons an acre were not uncommon, and some areas reached 200 tons an acre.

"Thunderstorms seemed to be continuous in Iowa in May and June," reports Wilson Moon, State Conservationist. "And they came just when fields were worked up for planting or freshly planted. That's the worst time of year for them to come."

Besides the loss of irreplaceable topsoil, seed was washed out, fertilizer was lost, crops were covered with mud, ditches and waterways were plugged or washed out, and more sediment washed into rivers, lakes, and reservoirs.

Despite the devastating soil losses, there were signs of encouragement. Soil conservation practices paid off. Farmers who

left a good cover of cornstalks and other crop residues on the surface stopped erosion on gently sloping land. Howard Elson, who farms in Jasper County in central Iowa, noticed a big difference between his plowed land and his conservation (minimum) tilled land. "We got erosion on our plowed land, and it's only 3- to 5-percent slope. It was a different story on about a third of our corn ground, though. We left about all the cornstalks on top of the ground on it, and didn't get any erosion."

Elson explained he switched to conservation tillage (two diskings rather than plowing) on a third of his corn land in 1973 because it was too wet to plow. He says this gave him his best stand of corn with the least work, so he did it again this year. He plans to switch to conservation tillage on his other land, because it's cheaper, saves time and energy, and stops soil from washing and blowing.

On longer slopes, many farmers found that terraces did a good job of holding back water. Robert Smith of Fremont County in the southwest part of the state says his terraced field withstood a 3-inch rain, that fell in 40 minutes, with little damage.

"They weren't built for this kind of rain, but they held pretty well," Smith said. "The hill was a sheet of water, and the terraces looked like they filled up right away. I got a little erosion between them, but not nearly as much as I've seen in fields close by that weren't protected."

"This spring's storms sold many people on conservation tillage and terraces," SCS State Conservationist Moon reports. "Some farmers are even building terraces this year in bean and corn fields. That destroys some of this year's crop, and farmers wouldn't ordinarily do that unless they figured it was important."

The large scale erosion in Iowa also prompted more people to seriously consider long-term agreements for cost sharing on soil conservation practices. "Those who had only part of their farm controlled could see they needed more protection, and are eager now to get conservation on the entire farm," Moon said.

According to the 1967 Conservation Needs Inventory, only 47 percent of Iowa's cropland is adequately treated against erosion. So, there's still a tremendous job to do. While the erosion losses this year will be hard to overcome, they may give added incentive for conservation work in the future. ♦

These Page County tile outlet terraces did a good job of holding water back after a 3-inch rain fell in 40 minutes. Crop residue on the surface also helped reduce erosion.

Accent on acorns. Mrs. Don Page harvests her "crop."

Good news for Louisiana wildlife

by Gene Warren
Information specialist, SCS
Alexandria, Louisiana

Acorns aren't just for squirrels—not when you can get upwards of $25 a bushel for them.

That's what's happening in the South where sawtooth oak trees—native to the Far East—are being introduced as a food for squirrels, deer, and other wildlife.

It started back in the late 1950's when the Soil Conservation Service Plant Materials Center in Georgia decided to see how these plants would adapt to conditions in the South. The Center supplied the first sawtooth oaks to soil and water conservation districts which arranged for local farmers to try them out on a volunteer basis.

Today, acorns from these trees are being shipped around the South for plantings on both public and private lands to attract wildlife.

One of the early areas where these trees were grown is now the Don Page farm in Vernon Parish, Louisiana. The Pages have 37 of the original trees planted in 1961 on about half an acre of their 20-acre farm. These trees were provided through the local Calcasieu Soil and Water Conservation District.

Last year, the Pages harvested their biggest crop.

"We picked and sold 13 bushels," reports Mrs. Page. "We asked $25 a bushel and got it. The acorns may be worth more but we had no idea how to sell them."

Some of the acorns were sold to the SCS in Jackson, Mississippi, to produce more seedlings in the South. The rest were shipped to landowners in Louisiana, Texas, and Arkansas.

From 1967 to 1971, the Pages gave away most of the acorns from their trees. SCS collected some for the Louisiana Forestry Commission to grow seedlings, the Louisiana Wildlife and Fisheries Commission used them in wildlife management areas, and many individuals collected them to plant on their own land. They are often grown along fence rows, drains, or in open areas of woods.

"We hope to keep the acorn project going and plant more acorns for seedlings," Mrs. Page said. "It seems that more and more people are becoming interested in wildlife and want to provide food and homes for them."

One of the bonuses of these trees is that they produce acorns much sooner than native oaks—at 6 to 10 years of age compared with 20 to 25 years for native oaks. Growth is relatively rapid. The 12-year oaks of the Pages now average about 40 feet in height and 8 to 10 inches in diameter.

Mature oaks usually grow to a height of 80 feet and will bear about 50 pounds of acorns a year—a pound equaling 40 to 80 acorns, depending on size. The trees do best on moist, well-drained sites and should not be planted in areas that flood frequently. ♦

Helping small town Maine

Planned development is as important to the small towns of America as it is to the great metropolises. Economic, cultural, and environmental losses may, in fact, hurt people in small towns more than city dwellers.

But while many major cities have full-time departments of planning and zoning, complete with computer banks and experts in half a dozen different fields, the small towns seldom have the facilities even to begin a comprehensive plan. Although the U.S. Department of Housing and Urban Development (HUD) will cost-share for planning work, the local cost is often more than a small town can bear.

Until recently, few of the 74 municipalities in the St. John-Aroostook Resource Conservation and Development Project (RC&D) area in northern Maine could take advantage of the HUD program. Only eight communities in the project area had a population of more than 2,000 people and 57 of the municipalities had less than 1,000 residents. Few had full-time town managers. Few had planning boards or access to the necessary expertise for comprehensive planning.

Today, that's changed. An unusual program based upon a very high degree of interagency cooperation is providing small communities in northern Maine with a team of technical experts to help them with their planning efforts.

The Small Community Planning Team meets monthly to coordinate its joint efforts. There are 35 members of the basic team — assisting the Northern Maine Regional Planning Commission, the RC&D project, the Soil Conservation Service (representing the three conservation districts in the project area), the Maine Bureau of Forestry, the Cooperative Extension Service (CES), the Office of Economic Opportunity (OEO), the Maine Department of Inland Fisheries and Game, and a consulting engineer chosen by the town. The team is chaired jointly by community planner Jerry Bohinski of the planning commission and Extension Agent Tom Sweetser, assigned to the St. John-Aroostook RC&D.

Each agency involved has its particular area of expertise. As a team, they offer a unified approach to comprehensive planning. Generally, the team works like this:

The Economic Planning Division of the Regional Planning Commission studies the population trends and characteristics, as well as regional and community economies.

The St. John-Aroostook RC&D, SCS, and state forestry people determine the physiographic features, soil characteristics, and land use capabilities of the area.

The community itself is studied by CES, the local planning board, OEO, and other community action agencies to

by Vincent J. Price
Information Division, SCS
Washington, D.C.

determine housing problems and needs and what must be done to correct substandard conditions.

CES and the local planning board also study the location and fitness of municipal buildings and facilities. With help from other social service agencies and depending on the particular needs of a certain town they sometimes study home and family service needs as well.

Several agencies survey the town's water and sewer needs, as well as consulting engineers hired by the town. The Regional Planning Commission's Law Planning Division can spotlight any problems needing attention in law enforcement and protection.

Additional experts join the team as needed. For example, the Maine Departments of Commerce and Industry, Environmental Protection, and Health and Welfare have participated.

When the research is completed, the Regional Planning Commission writes a summary of problems and recommendations. The town planning board and town selectmen arrange the problems in order of town priorities. Based upon these priorities, an action plan is developed by the entire Small Community Development Team, working with all other agencies involved in that town's plan. The priority action plan contains recommendations for implementation, the estimated costs of various projects, and suggested sources of assistance.

The plan itself is carried out by the selectmen and town planning board who work out a timetable based upon their budget.

Thomas Sweetser

"The Planning Commission, the Cooperative Extension Service, and the Soil Conservation Service provided the original stimulus for the team in 1968, but it quickly broadened and expanded from there," explains cochairman Tom Sweetser of CES. "When we first started, we were naturally thinking just about our own agencies and our own responsibilities, but as we worked together we came to understand the problems of the other agencies as well."

To alleviate possible tensions from interagency conflicts, the team called in a sociologist from the University of Maine. He interviewed each member individually, taped the interviews, and reported his findings. The team discussed the report and members say the nonpartisan views of the sociologist helped put interagency disagreements into better perspective.

The first town to develop a plan was Patten. S. Von Day, RC&D project coordinator, recalls that "the plan was worked out face-to-face with the other agencies, and it took some doing. There were some conflicts. But now, after several years, the team is really beginning to jell."

Work has speeded up since the Patten plan, as the team developed a structure and established a method of operations. Eight towns now have comprehensive plans, with nine more plans underway and 12 tentative starts scheduled.

Blaine is another town that has benefited. "You couldn't put a dollars and cents sign on the value of this to Blaine, it was so valuable," says Blaine Planning Board member Gordon "Red" Stitham. "The average citizen in these smaller communities doesn't understand comprehensive planning and we don't have the resources to do it all ourselves. These boys on the community planning team put us to work —and that was good."

Volunteers in Blaine collected a great deal of data. Sometimes it surprised them.

"You can live with something right under your nose and not realize it," says Stitham. "For example, we had a home survey and were surprised to discover the number of homes in a bad state of repair. We found homes where people had to carry their own water, and where there still were outhouses. There was one home with four people living in it, aged 79 to 85, and one of the women had to haul water from the well and then heat it on the stove to do the laundry. These were people who had built this country; it wasn't that they didn't want better things, but they were proud."

It took Blaine 16 months to complete a comprehensive plan. The town controlled the process. "The team had their suggestions," says Stitham, "but

continued on p. 20

What about plastic tubing?

by Elmer L. Barker
Soil conservation technician, SCS
Bellingham, Washington

A lightweight, flexible plastic tubing, installed by a laser beam-guided machine, is revolutionizing underground drainage in northwest Washington State.

There have always been problems in draining the flat, impermeable soils of this area. Until recently, most farmers used a combination of many open ditches and a few covered tile drains.

Open ditches were dependable but they cut farmland up into small, hard-to-work fields. The ditches needed frequent clearing, as well as fences to protect against livestock and bridges for moving farm equipment.

Covered drains were preferable, but they were more costly to install. Many farmers avoided them for this reason.

Today, however, new materials and installation methods are making underground drains more practical and more popular than ever before.

Early farmers in the area generally dug their ditches by hand. They filled the bottom with cobblestones, then covered them with soil placed over cut brush. These were called French drains.

A second method, used when there was plenty of good cedar timber in the Northwest, was to lay long split railings in separate but parallel rows on the ditch bottom. These were

bridged over with thick slabs of wood.

A third method became popular when sawed lumber was available to make box drains. These had openings along their length to collect water and were surprisingly durable.

In search of even more dependable drains, farmers turned to concrete and clay tile. They discovered early that concrete tiling would dissolve in the area's acid soils after a few years, so hard-baked clay became the accepted drainpipe.

Foot-length sections of clay tile were laid end to end in a continuous line, with water entering at each loosely butted joint. But there were problems. It was difficult to align the short, heavy tile correctly, and if even a single section rolled to one side during installation and back filling, the entire drain line could plug up. Boards with side cleats were sometimes laid beneath the tile to form a holding trough that would keep the tile correctly lined. Some manufacturers also made a hexagon-shaped tile to provide a flatter surface and better contact with the ditch bottom.

In some soils, filters were needed to keep sand from settling out and filling up the drain line. Gravel on and around the line was the best filter but it's expensive and difficult to haul and handle in wet fields. Wood shavings, sawdust, and chips were also used. Sometimes even old hay or leafless, small-stemmed brush was placed over a line to act as a filter.

Underground clay tile systems meant hard work and problems to many farmers. Often, they preferred the open ditches even though this left less land for crops.

Plastic tubing changes the picture. It comes coiled in 250 foot lengths weighing 70 pounds, and can be handled by one man. A similar amount of clay tile would weigh close to a ton!

Plastic tubing is durable. Some manufacturers claim it will last a century. The corrugated construction makes it strong and furnishes excellent areas for water intake holes spaced along the line. There is also a factory-installed continuous nylon filament sock to act as a filter against sand and sediment where this is needed in problem soils.

In 1971, dairyman Martin Vreudgenhil of Sumas, Washington, decided to use the new plastic tubing to drain 180 acres of his flat Puyallup and Sumas silty loam soils. Better drainage meant he could get his cows and farm equipment onto the land as needed. Also, he wanted to reduce the amount of fertilizer runoff from his pastureland.

Vreudgenhil couldn't get enough plastic tubing locally, so he sent a truck straight to a California factory for a full load. He had no tube-laying machine, so he hired a Canadian contractor to install his first 13,500 feet of drain.

Since then, a number of Vreudgenhil's neighbors have put in plastic drainage systems and one man—Bill Stensland—has bought a laser-guided machine to do the tube-laying job.

The job begins with a topographical survey of the area to decide on the length, depth, and suitable grade of the pro-

continued next page

(Far left) Trencher in operation.

(Near left) Bill Stensland at controls of laser gun.

posed drainage line. This predetermined gradient is set into the laser-beam projector which is stationed at, or slightly beyond, the drain outlet.

The laser-guided machine provides for great accuracy, so tubing can be placed on the grade desired. One operator can put in a mile of drain a day, even on difficult terrain such as swampland or mudflats.

The projector for the machine is powered by a six-volt wet-cell battery similar to the ones in automobiles. The battery not only powers the laser but energizes a miniature motor that swings the beam on a 30-degree arc. Within this area, the machine can turn at will while still maintaining the exact grade. This is important; a sag or hump in a line can cause sediment to settle out and restrict water flow.

A few hours after plastic tubing has been installed water will run almost crystal clear out of the new drain. There will be little sediment; even manure, fertilizer or herbicides spread on the land are filtered through two or more feet of soil before they reach the drain.

With modern trenching machines there is little disturbance of topsoil. Dirt removed during the digging is routed around and right back into the ditch itself without touching the cropland on either side.

By contrast, older methods of trenching piled excavated soil onto adjoining land, sometimes damaging crops. A separate operation was needed to return disturbed soil to the ditch.

Dairyman Martin Vreudgenhil is pleased with his 23,500 feet of new drains. He can get cattle and equipment out on his fields almost anytime he wants to—and forage production has jumped.

Neighborhood farmers have installed more than 160,000 feet of plastic tubing. And nonfarmers use it too. Nearby Blaine High School has installed an extensive grid of underground plastic tubing drains to dry out their waterlogged football field and playground.

Farm or football field—at work or play—new methods of drainage are helping people use their lands more efficiently. ♦

GREEN PLANTS KEEP GOLD COMING FROM CALIFORNIA'S FOOTHILLS

by W. Curtis Sharp
Plant materials specialist, SCS
Lockeford, California
and Clarence U. Finch
Conservation agronomist, SCS
Fresno, California

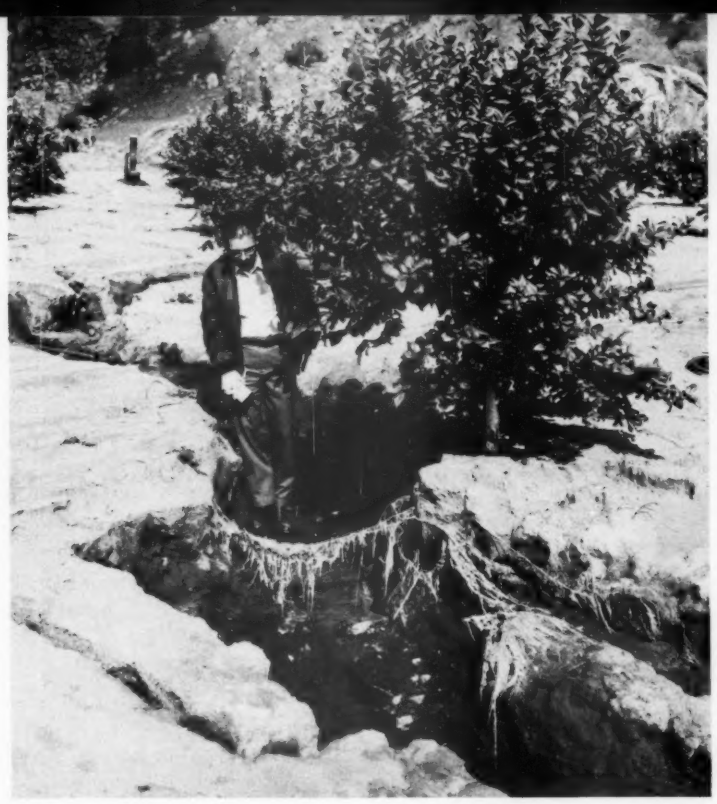
There's still gold in California's hills—but there are problems as well.

The booming orchard and vineyard industry in California has caused growers to head for the Sierra Nevada foothills. Climatic and soil conditions are favorable, but a major enemy haunts their every move: Soil erosion.

The sloping hills of the Sierras, laid bare of protective cover, invite ecological disaster. Soil losses of up to 300 tons an acre have been recorded. And farming methods brought from the flat lands, such as maintaining weed free conditions, further compound the problem.

Cover crops have been used in California's orchards and vineyards for over 70 years. Their value in improving water penetration, controlling erosion, and reducing soil compaction is well documented.

Their use today, however, frequently is dependent on how well they fit into modern orchard and vineyard technology. Some plant species used in the past, like mustard or sundangrass, complicate modern tillage, irrigation, and harvesting practices.



Growing trees on weed-free bare ground, while acceptable on level land, can mean severe erosion on sloping orchardlands.

To overcome this problem, SCS conservationists in California were faced with developing an effective cover crop system that would fit into present and future orchard and vineyard operations. We had to take into account the fact that plants useful under one set of conditions could be a liability under other circumstances.

In the late 1960's, the SCS Plant Materials Center (PMC) in California selected grasses and legumes as having potential cover value for hilly areas. Only a few had previously been used in orchards or vineyards. Some were dryland range plants, others were primarily used in irrigated pastures. They were produced at the PMC and made available for field tests.

SCS soil conservationist Gibbons Moore, working with Pond Poso Resource Conservation District (RCD) cooperators, located several test sites on orchards and vineyards. Other evaluations were also made in the Patterson and Navelencia RCDs with the help of district conservationists Eldon Glenn and Morris Martin. A total of 115 plantings were made in a 5-year period in eleven resource conservation districts.

As usual, some plantings proved successful and some did not. From these results, we have prepared recommendations for plants and their management for the wide variety of circumstances experienced in California.

The most versatile cover crop system proved to be "strip management." The cover plant is grown and managed in strips between the vine or tree rows.

Restricting the ground cover to an area between rows reduces many previous objections to cover crops, while at the same time it utilizes most of their advantages. The vegetative growth can be controlled by mowing. This reduces the danger of frost damage and the amount of residue buildup; the latter problem can complicate harvesting. The amount of vegetation can be manipulated to reduce its competition with the tree or vine for nutrients and moisture. In addition, mowing consumes less fuel than cultivating.

One of the most successful cover plants is Blando bromegrass, an annual originally selected for its use on California's rangeland. It can tolerate close clipping for residue and frost control, yet produce a dense and deep root system. It perpetuates itself by reseeding.

With an improved arsenal of cover crop plants and better technology for their use, the gold in California's foothills can keep on coming. ♦

Plant materials and waste management

by Donald H. Fulton
State range conservationist, SCS
Boise, Idaho
and Glen L. Nielson
District conservationist, SCS
Caldwell, Idaho

What do you do with a continuous flow of thousands of gallons of water per minute containing high caustic soda and potato peelings?

Recycle and use it for irrigation water. That's what the J. R. Simplot Company is doing at their Caldwell, Idaho, plant where several thousand tons of potatoes are processed daily into french fries for distribution nationwide.

Under the guidance of James Oates, director of environmental affairs for the Idaho firm, a unique system has been devised to recycle waste water from the operation. It is used to irrigate about 850 acres of land which grows feed crops for the company-owned feedlots. It provides for almost total utilization and zero discharge of waste water.

"I don't want to give the impression that all of our problems are solved," says Oates with a smile, "but we have come a long way. And we're getting more efficient every year.

"Our real challenge was to balance the water and crops on a year-round basis. A farmer doesn't irrigate in the winter, and he isn't concerned when ordinary water runs off his fields. But we have to use all of the water 24 hours a day, every day of the year, and maintain total retention on our land."

When the potato processing plant began primary treatment operations in 1964, five large earth reservoirs covering 30 acres were used to contain the water for treatment. The treated water was discharged into the nearby Boise River.

In 1967, Oates working with the general manager of the feedlot and farm operation, began a pilot "land disposal" program to test the effectiveness of using the waste water

(Left) Latar orchardgrass is mowed, windrowed, and left to partially dry for a few hours before being chopped and fed to cattle. (Right) These steers eat chopped hay from fields irrigated with plant waste water.

for irrigation. He also launched a search for suitable crops that would tolerate these conditions.

That's when the Soil Conservation Service and the Canyon Soil and Water Conservation District were asked to make a study of the soil infiltration rates and determine which types of forage would be best adapted. Forage trial plots were developed which included a wide variety of grasses and legumes. Latar orchardgrass and creeping meadow foxtail responded the best.

Then an extensive improvement program began. Currently, some 850 acres have been leveled, planted and put under irrigation. This necessitated lining 25,000 feet of canal with concrete, installing 4,200 feet of underground pipeline, completing two tailwater recovery systems (one remains to be installed), constructing a quarter mile of new drain, and improving about 3 miles of old open drains. SCS served as consultant to the private engineering firm which designed the system.

In 1969, a "dry peel" process was installed, resulting in a drastic reduction in water usage. This new method of peeling potatoes decreased the amount of water needed from 5,000 gallons per minute to 3,500 or less. In addition, less caustic soda was needed.

Today, from 10 to 12 feet of water are applied to each acre every year, more than twice the average for nearby farms. Fields are irrigated every 6 to 8 days during the hottest part of the summer. If the plant is closed for vacations or repairs, water from the company-owned wells is used.

If excess water reaches the lower end of any field, it drains into a specially designed collection system which pumps it back to the top of the field. By this method, all the water remains on company land.

According to Oates, the water leaves the plant at a temperature of 75° to 80° F., and is very high in nitrogen. "It's this combination of warmth and nutrition," he says, "that makes it possible to harvest six cuttings per year from the grass crop, with an estimated production of around 8 tons of dry forage per acre." The average hay crop in the area is 4 tons.

It is estimated that 800 pounds of nitrogen per acre are applied to the soil each year through the waste water irrigation process. **The harvested forage contains from 14 to 18 percent protein.**

The grass crop is green-chopped and mixed with other rations, including the waste potato which is separated from the process water. It provides partial feeding for approximately 26,000 yearling steers.

"Getting established the way we are today has been very expensive," Oates states, "but we feel that every dollar spent will pay in the long run. Last year a pipeline cost us $100,000, but it permitted us to apply our wastes to another 350 acres."

After 1974 most of the construction will be completed and then more effort will be directed to refining and improving the present system.

"Our operation now has what you might call a self-contained recycling system," comments Oates. "The wastes from the processing plant either feed the steers directly or supply nutrients for grass which feeds livestock. In turn, the wastes from the livestock feeding pens are applied to the fields to produce more forage."

Oates notes that his company has faced some new problems in getting the system established. "Our grass is still green and growing during the winter when everything else is covered with snow and ice," he says. "One of our problems has been learning how to irrigate the fields during a snow storm!" ♦

OIL SHALE (Continued)

largest migratory mule deer herd in the world. For this reason, the area should be revegetated to include native browse plants such as mountain mahogany, serviceberry, antelope bitterbrush, and four-wing saltbrush.

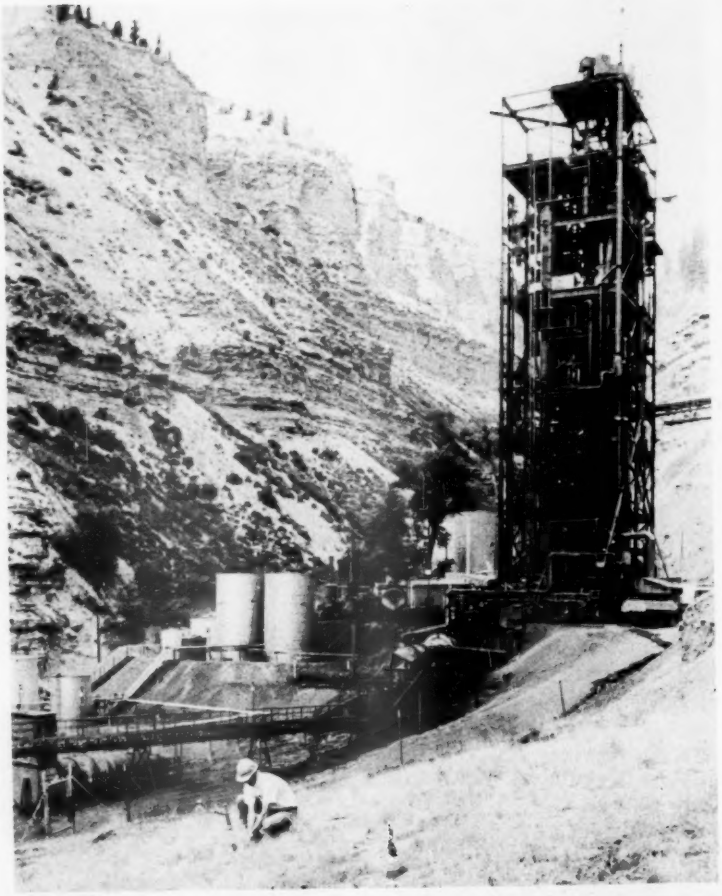
The problem here is twofold: native plants are not grown commercially in large enough quantities to replant whole mining areas.

And, as the land is mined, it changes to the point where many plants once native to the area are not adapted to the new soil conditions.

The SCS plant materials program can provide a major contribution. SCS plant materials specialists can help to supply needed species to commercial growers and can work to develop new varieties to meet changed conditions of the land. The special technologies required are not generally available in other agencies.

With the national need for new energy sources, the development of oil shale fields appears to be inevitable. Everyone involved in the project is well aware that this will have a major impact on Colorado's environment.

SCS people are working with many other experts to help solve the complex problems arising from the extraction of this natural resource from the ground. We hope to continue using our special knowledge of soil, water, plants, and wildlife for the benefit of Americans and the American land. ♦



(Above) Colony's seven-story-tall retort uses heat-transfer principle to produce crude oil from crushed shale. A revegetation test plot is in the foreground. (Below) This truck hauls about 75 tons of raw shale from inside the mine to the primary crusher.

(Mining area pictures courtesy of Colony Development Corporation, Atlantic Richfield Company.)

Progress in stabilizing manganese mine spoil

by H. Wayne Everett
Plant materials specialist, SCS
Lexington, Kentucky

Stabilizing surface-mined land with plants is rarely easy, and Virginia's manganese mine spoil is one of the more difficult to reclaim.

But people have tried, at great expense, for many years. Some groups have spent more than $2,000 per acre for grading, adding topsoil, and making trial plantings on manganese spoil.

Soil Conservation Service plant materials centers have had more success with low-cost stabilization than most groups, although they have faced the same tough obstacles. These obstacles include high acidity (pH 3.8-5.4) and low nutrient content; manganese toxicity, which can destroy plantings or reduce their effectiveness in preventing erosion; and a soil so disturbed by mining that it is practically structureless, which causes instability and severe shrinking and swelling.

The nearly 400 acres of manganese spoil in Virginia's Evergreen and Skyline Soil and Water Conservation Districts illustrate the difficulty of revegetating the land. Even after 15 years there is little or no volunteer revegetation, and erosion is severe.

More than 50 species of trees, shrubs, grass, and legumes developed by SCS plant materials centers were planted on Virginia manganese spoil in 1960, 1961, 1962, and 1966 to evaluate their usefulness. Grass and legumes were seeded with and without mulch and lime. Herbaceous and woody plants were tested with and without fertilizer.

Of the 15 grass and legume species, those with the highest germination rates and best stand establishment had been both mulched and limed. But even good stands deteriorated quickly because the soil was so unstable it eroded away from the plant roots, exposing them to the sun and wind.

Frost heaving had the same effect. Freezing of the soil pushed the soil and plants up 1 to 2 inches; when the ice melted, the soil lowered again, leaving the roots exposed. All herbaceous plants established the first growing season eventually were destroyed or died.

Of the 19 shrub and 17 tree species planted, less than half survived the first year. Survival and growth were improved by the use of fertilizer. A slow-release fertilizer, acting for 8 to 12 months and composed of ammonium, potassium, phosphate, and magnesium, worked the best.

Trees and shrubs with the best survival and growth rates were European black and speckled alder, autumn olive, bristly locust, and black locust. At least 70 percent of these plants survived when the slow-release fertilizer was applied to the planting holes.

Pine species did not survive or grow well because they were blown over and exposed to the drying force of the sun and wind. Larch species survived well but have produced little erosion control litter on the soil surface.

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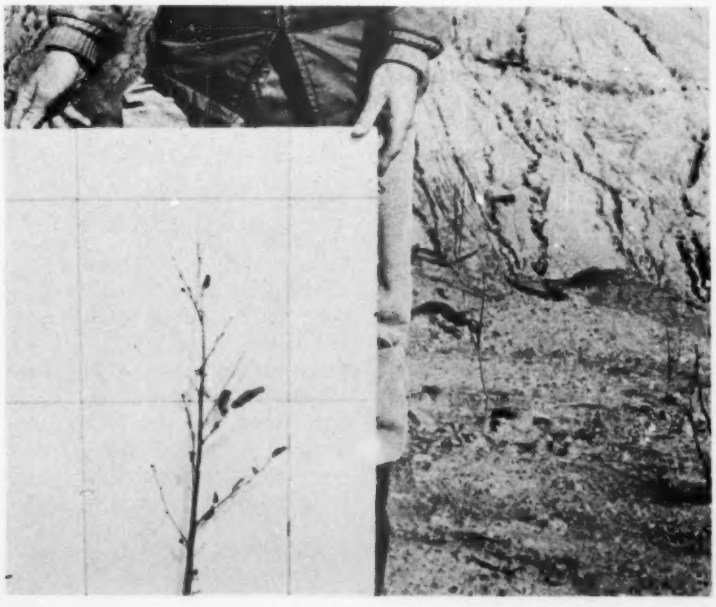

Alder plants at the end of their first **growing season on manganese mine spoil. Squares on the white board are 12 inches tall.**

Recent evaluations of 8-year-old woody species for vigor and growth show that European black alder, black locust, 'Arnot' bristly locust, 'Cardinal' autumn olive, and European and Japanese larch are best. The European black alder was the most successful.

On steep slopes, all plantings failed because the structureless soil eroded. Plantings on graded and leveled areas were successful if soil amendments and certain species of woody plants were used.

Based on these results, SCS plant materials centers can recommend specific plants to help stabilize at least some of Virginia's manganese mine spoil effectively and relatively economically. ♦

HELPING SMALL TOWN MAINE

continued from page 11

if we didn't agree with them, they were flexible and would bend to our wishes. There was no pressure put on us, and that was the greatest thing in working with these gentlemen. They weren't selling us a bill of goods. They're out for your community and the people in that community."

When the plan was completed, the town established its priorities. So far, Blaine has accomplished its first four goals, including the construction of a dam to provide water for fire protection.

Another benefit of the program has been greater cooperation between towns. "I've seen towns that I thought were never going to get along work together to solve problems," says Stitham. "It was the boys in the regional planning office, the Soil Conservation Service office, and the RC&D that showed us how to do it."

Extension's Tom Sweetser estimates that the job of preparing comprehensive plans for all 65 small communities in the program area will take another 10 years. He points out that "We don't do planning until there's enough local interest to move ahead. Currently we have about a dozen towns waiting to receive our assistance."

The planning effort costs slightly under $9,000 per town. RC&D funds pay $1,200 of SCS expenses and $2,000 of CES expenses. The Regional Planning Commission's expenses come to about $3,000. The other state and federal agencies expend about $2,000; and the towns lay out a few hundred dollars in cash in addition to their volunteer labor in data collection and surveying.

The plans are worth the expense. "I don't see how you could handle it any other way," says Kenneth Arndt of the Northern Maine Planning Commission. "This is planning that has got to be done."

As for Blaine's "Red" Stitham, he says, "I'm a great baseball fan. If I had a team, these are the boys I'd want on it. They don't come in and bully you. But they know what they're doing and they sure are efficient." ♦

NEW VERSION OF MULTIFLORA ROSE?

Plant scientists at the Soil Conservation Service's Plant Materials Center in Quicksand, Kentucky, are working to develop a multiflora rose that will not spread.

The selection they are working on, which was gathered in Ohio, blooms as freely as the current multiflora rose, but not as many blooms set on it, nor do as many mature. Those seeds which do mature have a low rate of germination.

Multiflora rose has been planted extensively in the United States over the past 25 years as a living fence for livestock, as food and cover for wildlife, and for beautification.

An important winter food for many song and game birds, it spreads through bird-carried seeds. Where conditions are particularly favorable to its spread and growth, it can be come a dominant pest. It has been declared a noxious weed in some states.

The spread can be particularly serious in wood borders, field hedgerows, and on crop and pasture fields that are either abandoned or receiving low-level management.

Multiflora rose is still produced in quantity by commercial nurseries and is still extensively used in some areas. It is because of its conservation value and the fact that it is still produced and used that SCS is searching for a multiflora rose that will not spread.

An Asian species, multiflora rose has been used in this country since 1800 as an ornamental and as a rootstock. Many of our best garden rose varieties are budded from it.—by DIANA MORSE, *information specialist, SCS, Washington, D.C.* ♦

Recon . . .

36-24-36? How is American agriculture shaping up in the 1970's? The Bureau of the Census hopes to get all the vital statistics during the 1974 Census of Agriculture. The Bureau, which is part of the U.S. Department of Commerce, conducts the census of agriculture every 5 years.

Questionnaires will be mailed to farm operators the last week in December. To prevent questionnaires from getting lost with the Christmas wrappings, the Bureau plans an extensive publicity campaign. Radio and TV spots, newspaper and magazine coverage, posters, pamphlets, and celebrity endorsements will be used to alert farm operators to the questionnaires.

Statistics for counties will become available about November 1975 and for states about March 1976. The complete census will be published by September 1976, according to Bureau officials.

Scenic preservation hits the road. Quiet, tree-lined roads in Wisconsin may now be preserved in all their pastoral charm. The state has a new "rustic roads" law; municipalities can ask that roads or portions of roads under their jurisdiction be designated as "rustic roads" and restricted for pedestrian or bicycle use, or divided to separate vehicular, pedestrian, and bicycle traffic. Applications must be approved by an 11-member Rustic Roads Board in the state Department of Transportation. Under the program, participating communities may receive state aid.

Chicago sludge helps land. Chicago is shipping more than half its treated sewage sludge 200 miles down the Illinois River to Fulton County, where it is used to fertilize formerly strip-mined land.

The Metropolitan Sanitary District, which operates the land reclamation program, first treats Chicago wastewater by settling it through a heat process. Then the dry sludge is carried downriver by barge and pumped by underground pipeline into giant reservoirs. High-powered sprinklers spray it over the land.

About 1,700 acres of the land is planted to corn, soybeans, and other crops. So far, more than $400,000 has been returned to the Sanitary District from sale of the crops.

Conservation practices such as minimum tillage, land leveling, and runoff basins are important in the program. A control system checks the quality of surface runoff before discharge into natural streams and lakes. Monitoring wells check ground water quality.

Another 700 acres of land in the program is used for recreation. Included are 14 miles of hiking trails and several lakes for fishing.

Soil erosion is destroying Haiti, according to a *New York Times* story. Most of the topsoil is gone in this once productive country, now one of the poorest in the hemisphere, and floods and silt wreak havoc in the populous valleys. Since wealthy farmers own most of the valley farms, says the *Times*, the poorer Haitian peasants clear land for farms or cut wood for fuel on the steep mountain slopes, inviting erosion during tropical rains. Many mountaintops are already bare, and "the damage to agriculture and to the environment is incalculable." Reforestation is being tried, but in the words of one foreign aid official, "you can't take peasants off a hillside and tell them to go starve somewhere else."

Porous parking lots soak up rain. Parking lots paved with porous asphalt are being tested near Houston, Texas, and at the University of Delaware in Newark. The tests allow the rainwater to seep through and return to the water table below.

The porous asphalt is made of larger-than-ordinary rocks. Rainwater passes through the small holes or "pours" between the rocks.

Rocks and sand under the asphalt form a reservoir capable of storing 5 inches of rain until it either percolates into the soil or is carried away by subsurface drainage.

Franklin Institute Research

Laboratories of Philadelphia developed the porous material and will collect and check data on the test lots.

Slag used for shoreline erosion control. Baltimore County, Maryland, recreation and parks officials have used slag from a steel plant as fill to control shore erosion and reclaim land along the Chesapeake Bay. Slag is placed along the shoreline to a depth of 6 feet and a thickness of 4 feet. Clay and sand are then piled on top of the slag. This helps prevent erosion caused by tides, motor boats, or floods.

Recreation and parks officials say over 400,000 square feet of land have been preserved or reclaimed with slag so far. The cost is said to be 80 to 90 percent cheaper than conventional bulkheading material such as stone or concrete block.

EPA sounds off on noise. EPA intends to propose noise control standards for two major noise producers: trucks (medium sized and heavy duty) and air compressors. The agency has also listed 20 other candidates for noise standards, including such ear-splitters as dump trucks, jack hammers, pile drivers, snowmobiles, concrete mixers, pneumatic tools, and trail bikes.

Soil surveys

California

El Dorado Area. By John H. Rogers. *1974. Soil Conservation Service in cooperation with University of California Agricultural Experiment Station. 89 pp., illus.; maps.*

Delaware

Sussex County. By William Ireland, Jr., and Earle D. Matthews. *1974. Soil Conservation Service in cooperation with Delaware Agricultural Experiment Station. 74 pp., illus.; maps.*

Georgia

Bryan and Chatham Counties. By Robert L. Wilkes, J. H. Johnson, H. T. Stoner, and D. D. Bacon. *1974. Soil Conservation Service in cooperation with University of Georgia Agricultural Experiment Station. 71 pp., illus.; maps.*

Illinois

Logan County. By G. W. Hudelson. *1974. Soil Conservation Service in cooperation with Illinois Agricultural Experiment Station. 99 pp., illus.; maps.*

Iowa

Guthrie County. By Robert C. Russell, Raymond I. Dideriksen, and Charles S. Fisher. *1974. Soil Conservation Service in cooperation with Iowa Agriculture and Home Economics Experiment Station. 117 pp., illus.; maps.*

Louisiana

Ouachita Parish. By Dayton Matthews, Emmett F. Reynolds, Garland P. Colvin, Tracey A. Weems, Clay A. Ray, James E. Seaholm, and W. Wayne Kilpatrick. *1974. Soil Conservation Service in cooperation with Louisiana Agricultural Experiment Station. 80 pp., illus.; maps.*

Michigan

Charlevoix County. By S. D. Alfred and A. G. Hyde. *1974. Soil Conservation Service in cooperation with Michigan Agricultural Experiment Station. 122 pp., illus.; maps.*

St. Clair County. By Gilbert R. Landtiser. *1974. Soil Conservation Service in cooperation with Michigan Agricultural Experiment Station. 113 pp., illus.; maps.*

Minnesota

Norman County. By Malvern N. Jacobson. *1974. Soil Conservation Service in cooperation with Minnesota Agricultural Experiment Station. 112 pp., illus.; maps.*

Nebraska

Howard County. By Charles F. Mahnke, Charles L. Hammond, and Laurence E. Brown. *1974. Soil Conservation Service in cooperation with University of Nebraska Conservation and Survey Division. 89 pp., illus.; maps.*

North Carolina

Transylvania County. By John M. King, John W. Turpin, and Daniel D. Bacon. *1974. Soil Conservation Service and Forest Service in cooperation with North Carolina Agricultural Experiment Station. 71 pp., illus.; maps.*

Texas

Terrell County. By August J. Turner and Robert E. Fox. *1974. Soil Conservation Service in cooperation with Texas Agricultural Experiment Station. 35 pp., illus.; maps.*

Wharton County. By Harry F. McEwen and Jack Crout. *1974. Soil Conservation Service in cooperation with Texas Agricultural Experiment Station 43 pp., illus.; maps.*

Virginia

Stafford and King George Counties. By Dan Isgrig and Adolph Strobel, Jr. *1974. Soil Conservation Service in cooperation with Virginia Polytechnic Institute and State University. 124 pp., illus.; maps.*

Washington

Cowlitz Area. By Willard A. Call. *1974. Soil Conservation Service in cooperation with Washington Agricultural Experiment Station. 112 pp., illus; maps.*

Meetings

August

11–14 *Conservation Education Association, Syracuse, N.Y.*
11–14 *National Farm and Power Equipment Dealers Association, Minneapolis, Minn.*
11–14 *Soil Conservation Society of America, Syracuse, N.Y.*
12–14 *Conference on Great Lakes Research, Ontario, Canada*
12–20 *Tenth International Congress of Soil Science, Moscow, U.S.S.R.*
14–16 *American Society of Civil Engineers, Irrigation and Drainage Conference, Biloxi, Miss.*
18–21 *American Institute of Chemical Engineers, Salt Lake City, Utah*
18–21 *American Agricultural Economics Association, College Station, Texas*

September

4–6 *American Water Works Association Chesapeake Section, Ocean City, Md.*
8–11 *American Fisheries Society, Honolulu, Hawaii*
9–13 *Seventh Congress—International Association for Research Into Water Pollution, Paris, France*
10–14 *Third International Man, Air, Water, Noise and Waste Exhibition, "Environment Expo," Paris, France*
11–13 *International Association of Game, Fish and Conservation Commissioners, Honolulu, Hawaii*
22–26 *National Association of State Departments of Agriculture, Milwaukee, Wis.*
22–27 *SCS State Conservationists Annual Meeting, Lexington, Ky.*
22–27 *Association of Conservation Engineers, Rapid City, S. Dak.*
29–Oct. 2 *American Forestry Association, Mackinac Island, Mich.*

October

5–8 *National Environmental Sanitation & Maintenance Educational Conference, Chicago, Ill.*
6–11 *Water Pollution Control Federation, Denver, Colo.*
9–13 *American Horticultural Society, Arlington, Va.*
10–11 *American Forest Institute, Minneapolis, Minn.*
11–14 *National Association of Biology Teachers, Inc., New York, N.Y.*
12–15 *Farm and Industrial Equipment Institute, Orlando, Fla.*
14–17 *American Society for Testing and Materials, Detroit, Mich.*
15–18 *Future Farmers of America, Kansas City, Mo.*
15–18 *National Conference of Editorial Writers, Louisville, Ky.*
15–18 *National Recreation Research Applications Workshop, Copper Mountain, Colo.*
20–24 *National Association of County Agricultural Agents, Tucson, Ariz.*
20–25 *National Congress for Recreation and Parks, Denver, Colo.*
21–25 *Association of Engineering Geologists, Denver, Colo.*
21–25 *American Society of Civil Engineers, Kansas City, Mo.*
23–26 *National Council for Geographic Education, Chicago, Ill.*
27–30 *Sprinkler Irrigation Association, Lake Buena Vista, Fla.*
28–30 *American Plywood Association, Houston, Tex.*
31–Nov. 1 *American Association For Vocational Instructional Materials, Atlanta, Ga.*

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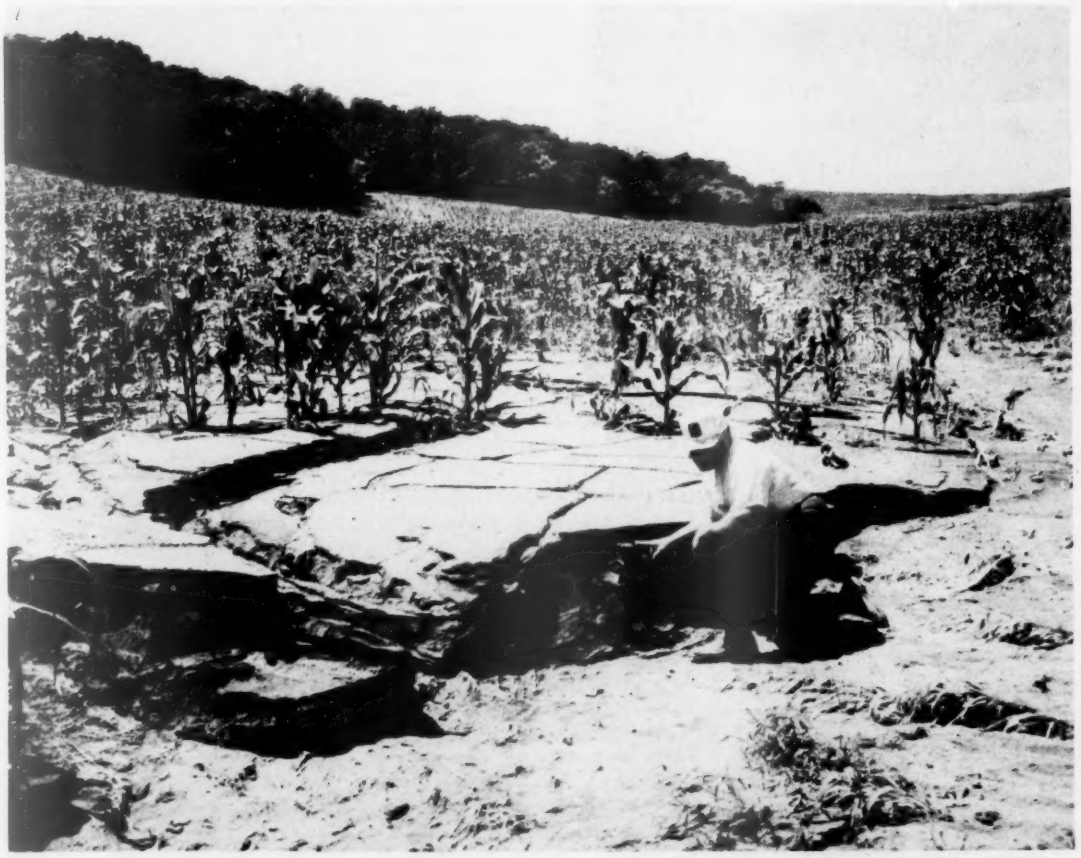

Silt deposit from heavy rains in Monona County, Iowa. (See "Wet, wild spring in Iowa," page 7.)